



An Investigation of Hearing Loss among School Age Children through Audiological Assessment in Ibadan, Oyo State, Nigeria

Nijeryalı Okul Çocuklarının Odyolojik Değerlendirme ile İşitme Kaybı Ölçümleri Üzerine bir Araştırma

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ABSTRACT. The study investigated hearing loss among school age children in Ibadan, Nigeria. An expo - facto research design was adopted and three hundred pupils were selected through purposive random sampling method for the study. Two validated research instruments were used. Three research questions were answered and one hypothesis was tested. The data collected was analysed using percentage, Pearson product moment correlation and analysis of variance. The result revealed no significant impact of parents socio-economic status on the affected children ($r=0.005$; $p> 0.05$), ($r= -0.073$; $p> 0.05$) and significant differences among hearing losses of pupils from low, medium and high population densities areas ($F=66.869$; $df= 2,297$; $p< 0.05$), ($F=14.279$; $df= 2,297$; $p< 0.05$). The findings also revealed mild, moderate and moderate-severe types of hearing losses among the affected children. The study recommended the establishment of formidable and functional hearing testing centre, in every local government headquarters to detect children with hearing loss. Also, hearing assessment should be made mandatory in the Universal Basic Education policies as prerequisite to school entrance.

Key words: Hearing loss, audiological assessment, school age children

Background to the study

Students with hearing loss are the largest single population of children requiring special services in schools and majority of these children are being mainstreamed into regular classrooms (Better Hearing Institute, 1999). Evidence indicates that high incidence and prevalence of hearing loss elicits concern all over the world. In 1995, the World Health Organisation (WHO) estimated that there were ten million people with hearing difficulties worldwide (Smith, 1998). Roeser and Downs (1998) reveal that congenital profound hearing loss occurs in 1 out of 1000 births worldwide. In 2001, the WHO estimated that 250 million people worldwide had hearing impairment of whom two thirds were in developing countries (WHO, 2002).

In developed countries like UK and US data from the latter reported that over 12,000 babies in the US leave hospital each year with undetected hearing loss, and that 500,000 young children develop profound hearing loss before learning a spoken language (Hear This Organisation, 2002). A 1994 estimate of prevalence of hearing loss in United States reported that slightly less than 1 million or 1.8% of youth under the age of 18 years has a hearing impairment (Holt & Hotto, 1994; National Centre for Health Statistics, 1994). Other estimates using different but more inclusive criteria range as high as 5% (Blanchfield, Feldman, Dunbar, & Gardner, 2001).

Northern and Downs (2001) report that 1 child in 1000 is born deaf, 2 more children in 1000 become deaf during their early childhood years, and that between 10% and 15% of children who receive hearing screenings at public school fail the test. Notably, the majority of these children have conductive hearing loss. The number of children with hearing impairments, ages 6 to 21, served in the public schools under the Individuals with Disabilities Education Act (IDEA) Part B in the 2000-01 school year was 5,775,722 (US Department of Education, 2005).

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The figure generally quoted for prevalence of hearing impairment in the UK is 1 in 7, or approximately 9 million people (RNID, 2003), including around 700,000 who are severely or profoundly deaf. Most of the deaf and hard of hearing people in the UK have developed hearing loss as they become older. If this situation prevailed in developed countries like America and UK one can imagine a country like Nigeria where health problem is of great concern.

In developing countries like Nigeria, the general awareness of hearing impairment is low, lack of resources has resulted in very few screening programmes and the incidence of hearing impairment among the people is high (The Hearing Profile of Nigerian School Children, 2000). Mba (1995) opines that hearing impairment ranks among the leading causes of chronic disability in Nigeria. It is estimated that one person in every one thousand people has a serious hearing problem in a general population of which 15 to 18 percent comprises school age children. Among Nigerian school children in Lagos, The Hearing Profile of Nigerian School Children (2000) observes that as many as 13.9 per cent of the school pupils suffer from hearing loss.

A number of children developed hearing loss during early childhood (congenital or pre-lingual hearing loss) but parents and teachers do not recognise this as such because of the different communication of children with a developmental delay. Others develop hearing loss later in life (adventitious or post-lingual hearing loss). These children with congenital or adventitious hearing loss, many of them may go undetected until their school age year and some of those that are even detected are not cared for (this may be as a result of low socio-economic status of their parents, paucity of experts, inadequate facilities, etc) until the loss starts to adversely affect the child socially and/or educationally. Hearing loss goes undetected according to Audiology Awareness Campaign (2007) because it is:

Gradual in nature: Loss of hearing can develop so slowly that one is not aware of any change from year to year. A loss of one or two decibel per year may not be noticeable;

Partial in notice: One can develop a hearing loss for high frequency sounds that affect the clarity of speech but still have normal hearing sensitivity for low frequency sound so one hears speech and background noises at a relatively normal loudness;

Painless in feeling: Usually, there is no feeling or sensation that alerts one to a change in hearing loss especially if it is slowly progressive; and

Invisible physically: The person with a hearing loss does not look any different and one cannot detect hearing loss by looking into someone's ears. Only an audiological evaluation can determine whether a hearing loss is present.

Parents and teachers should be informed of the increased risk of hearing impairment in children and their concern about hearing should always prompt diagnostic assessment because delay in identification and management of hearing impairment may impede the child's ability to adapt to family, school and community life activities and may cause behavioural problems.

An investigation of hearing loss among school age children through audiological assessment to determine children with or having the potential of hearing loss is justified considering the impact of hearing loss on speech and language acquisition, cognitive achievement and social/emotional development. This is because reduced hearing during these periods interferes with the development of speech and language skills, and thus, a child will not receive adequate auditory, linguistic and social stimulation required for speech and language learning, social and emotional development and the family functioning will inevitably suffer. (NIH, 1993). Owolawi and Eleweke (2000) had earlier argued in favour of the need for nationwide hearing screening programme in Nigeria that will among other benefits, facilitates the development of high risk individuals being duly registered, early detection of cases of

hearing loss and initiation of rehabilitation procedure to ameliorate the adverse effects of hearing impairment.

Statement of Problem

Hearing loss is such a gradual, slow and imperceptible decline that most people do not realise it occurring. The nature of this invisible impairment allows those affected to appear as if it does not impede any part on them. In spite of the increasing concern globally about the high incidence and prevalence rate of hearing loss, developing countries like Nigeria among others had done little, as regards the audiological assessment of school age children. This could be attributed to paucity of audiologists, lack of awareness of hearing screening and unavailable audiological equipment such as audiometers, Auditory Brainstem Response (ABR) machines and Otoacoustic Emission (OAE).

University of Ibadan 60th anniversary special education stand in the exhibition ground attracted different people, children inclusive who want their hearing tested. It was clearly noticed there that, majority of those tested have their hearing thresholds within and around the border line of hearing loss, though not under sound proof test environment, yet the result still call for concern. Accurate assessment of hearing (audiometry) is vital to the diagnostic evaluation of children with or at- risk of hearing loss and for the determination of the underlying process, as well as in the planning of rehabilitation programmes. Hence, this study intends to investigate hearing loss of school age children in Ibadan using audiological assessment procedures.

In addition to the highlighted problems of shortage of audiologist, poor disposition to hear screening, unavailability of critical equipment and poor culture of periodic assessment, and there is no sufficiently trained personnel with requisite expertise and experience to man the available equipment where provided. Thus, the study will examine the poor level of audiological assessment with respect to the availability of adequately trained and exposed personnel.

Further, the general public, inclusive of the educated are not well informed about the problem of loss of hearing and the pertinent need for periodic audiological assessment particularly, its nature and the feature of gradual in occurring. This is a fundamental problem. This perhaps explains the often critical and unwarranted delay in seeking professional assistance for assessment and counseling at the onset of hearing loss when the problem is marginal and can be appropriately managed. Inadvertently, the problem will be deepened by delay, wrong and damaging uninformed traditional approach and self-medication which are adopted in the attempt to solve the problem.

The study objectives

The broad objective is to underscore the impart of audiological assessment in the better management of hearing loss and related problems, mitigating the problems as a result of early detection and inducing a sharp reduction in the cost of treatment in the event of available full blown case of the hearing loss problem.

The specific objectives are to:

- (1) Highlight the impart of audiological assessment for the general public with a view to sensitize them with how critical and fundamental it is to forestall hearing loss where it is possible;

- (11) Fill a certain gap in literature, particularly with respect to Nigeria; and
- (111) Generate recommendations, that could inform appropriate policy response.

Research Questions

- I. In primary school setting what is the prevalence of hearing loss among school age children?
- II What are the common types of hearing loss among the school age children?
- III. Does socio-economic status of the parents have any significant impact on the affected children?

Hypothesis

H₀₁: There will be no significant difference in hearing loss among children from low, medium and high population density areas.

METHODOLOGY

Research Design

The study adopted an expo-facto research design. This method was adopted because the researcher did not manipulate the variable of interest in the study.

Population

The population of this study comprised all the pupils in all primary schools in Ibadan, Oyo State.

Sample and Sampling Technique

Ibadan was purposively divided into three (low, medium and high) population densities areas. Six primary schools (two from each density area) were selected for the purpose of the study. The participants for this study comprised 300 school age children (mean age of 11.45 and SD of 1.96) i.e. 50 pupils from each school selected randomly from the six purposively selected primary schools from each of low, medium and high population densities area in Ibadan, Oyo State, Nigeria.

Research instruments

The following instruments were used in collecting data for this study:

- I) A calibrated Maico 52 Diagnostic audiometer; and
- II) A self-made questionnaire.
- I) Maico 52 Diagnostic audiometer is a two channel audiometer for advanced pure-tone and speech audiometer tests. It can be used for mobile audiometry in clinics, schools and homes. It consists of an audio oscillator which generates pure-tone of different frequencies (125Hz to12KHz), each tone is amplified to maximum of 110db HL and minimum of -10db HL. It uses two headphones for air-conduction (AC) test.
- II) A self-made questionnaire consisting of three sections. Section A is on demographic data, B is on socio-economic background of the pupil while section C covers impact of hearing loss on the pupils

Procedure for Test Administration

The researchers personally visit the selected schools with a letter of introduction from the Department of Special Education introducing him to the authorities of the schools. They later

educate the teachers on the importance of audiological evaluation most especially in detecting and managing children with or at - risk of having hearing loss.

Each child was assessed using audiometer and their threshold recorded in the audiogram accordingly. Otoscopy was performed before audiometry to ascertain free conduction of air and non-perforated tympanic membrane. The researchers conducted test and re-test assessment on teachers to establish the reliability and validity of the audiometer. The first part of the test focuses on screening these children on the three speech frequencies (500Hz, 1000Hz and 2000Hz) using air-conduction test only, to identify those with or at-risk of hearing loss. The second part of the programme is on the administration of questionnaire, one for the pupil and another one filled by the teacher on behalf of each child.

Method of Data Analysis

In analysing the data collected, the researchers used descriptive statistics of frequency count, percentage, means, standard deviation, t-test, Pearson Product Moment Correlation and Analysis of Variance (ANOVA). Frequency count, percentage, means, standard deviation and Pearson Product Moment Correlation were used in analysing demographic data and in answering the research questions while Analysis of Variance (ANOVA) was used in testing the stated null hypothesis.

RESULT

Table 1:- Age Distribution of the Pupils

Age Brackets	F	%
Less than 10 years	8	2.7
10-12 years	196	65.3
13-14 years	96	32.0
Total	300	100

Source: - Field survey.

Table 1 shows that 300 pupils were involved in this study of which 65.3% were between 10 to 12 years of age, 32% were between 13 to 14 years and very few, 2.7 % were less than 10 years.

Table 2: - Categories of Hearing Loss in High or Low Frequencies Losses.

Frequency level	No of affected pupils on the right ear	Number affected in % on the right ear	No of affected pupils on the left ear	Number affected in % on the left ear
500Hz(low frequency hearing loss)	167	55.67	39	13.00
2000Hz(high frequency hearing loss)	53	17.67	18	6.00

Source: - Field survey

Table 2 shows that 55.67% and 13% of the total pupils have low frequency hearing loss on their right and left ears while 17.67% and 6% have high frequency hearing loss on their right and left ears respectively.

Answering the Research Questions

Research Question 1: In primary school setting what is the prevalence of the hearing loss among school age children?

Table 3:- Hearing loss in Categories.

Hearing loss categories	Right ear (f)	Right ear %	Left ear (f)	Left ear %	Both Ears (f)	Both Ears %
Normal hearing (-10 to 24db)	136	46.00	246	81.97	131	43.67
Borderline/at risk (25db)	42	14.00	20	6.67	01	0.33
Mild H-Loss (26-40db)	110	36.67	25	8.33	15	5.00
Moderate H-loss(41-55db)	08	2.67	08	2.67	01	0.33
Moderate/severe (56-70db)	02	0.67	01	0.33	01	0.33
Severe (71-90)	—	0.0	0.0	0.0	—	0.0
Profound (>90)	—	0.0	0.0	0.0	—	0.0
Total	300	100	300	100.0		

Source: - Field survey

Table 3 shows that 118 pupils (39.34%) of the pupils examined have hearing loss at not more than moderate level and two pupils (0.67%) have moderate severe hearing loss at their right ear. Some 33 pupils (11%) have left hearing loss also at not more than moderate level and one of them has moderate severe hearing loss. Some 42 pupils (14%) are at-risk of having hearing loss on the right ear while 20 pupils (6.67%) are at-risk of having hearing loss on their left ear. This implies that there are children with hearing loss and those at risk of hearing loss within the regular primary schools setting.

Also, the data presented in Table 3 shows that 39.34% of the pupils examined have conductive right unilateral hearing loss at not more than moderate level. This implies that about one out of three pupils in public primary school has this type of hearing loss while 11% (1 out of 10 pupils) have conductive left unilateral hearing loss at not more than moderate level. 0.33 % (about 3 in 1000 pupils) has moderate severe hearing loss at both ears.

Research Question 2: What are the common types of hearing loss among the school age children?

From Tables 2 & 3, it could be seen that the most common type of hearing loss among the school age children is low frequency hearing loss with 55.67% and 13% at both right and left ears followed by conductive mild unilateral hearing loss where 36.67 % and 8.33% of the pupils have it on their right and left ears respectively. This is also followed by high frequency hearing loss of 17.67% and 6% at right and left ears with conductive unilateral moderate hearing loss in

which 2.67% of the pupils experienced it on their right and left ears. Also, 0.67% and 0.33% of the pupils have moderate severe hearing loss on their right and left ears respectively. There is no severe or profound hearing loss found among examined pupils.

Research Question 3: Does socio-economic status of the parents have any significant impact on the affected children?

Table 4: - Pearson Product Moment Correlation Showing the Relationship between Socio-economic Status and the Hearing Loss

Socio-economic status	Mode	Right ear hearing loss	Left ear hearing loss
SOS	R	.005	-.073
	Significance (p)	.926	.209
	N	300	300
Remark		Not significant	Not significant

Table 4 reveals that there is no significant relationship between socio-economic status of the parents and their children hearing level on the right ear with hearing loss ($r = 0.005$; $p > 0.05$) and on the left ear with hearing loss ($r = -0.073$; $p > 0.05$). This implies that the socio-economic status has no significant impact on the hearing loss of the children.

Testing the null hypothesis

H_{01} : There will be no significant differences in hearing loss of children from low, medium and high population density areas.

Table 5a & 5b: Summary of Analysis of Variance (ANOVA) Showing Hearing Loss and Various Densities Relationship

TABLE 5a. RIGHT EAR HEARING LOSS AND POPULATION DENSITIES RELATIONSHIP

Variable	N	Mean	Std.D	Source	Sum of square	df	Mean square	F	Sig	Remark
Low density	100	9.16	7.73	Btw groups	7712.99	2	3856.49	66.869	.000	sig
Medium density	100	18.20	8.36	Within groups	17178.68	297	57.67			
High density	100	18.74	6.58							
Total	300	25.37	9.12	TOTAL	24841.67	292				

Source: Field survey

TABLE 5b. LEFT EAR HEARING LOSS AND POPULATION DENSITIES RELATIONSHIP

Variable	N	Mean	Std.D	Source	Sum of square	df	Mean square	F	Sig	Remark
Low density	100	18.60	9.96	Btw groups	2127.68	2	1063.84	14.279	.000	sig
Medium density	100	15.52	10.30	Within groups	22128.32	297	74.506			
High density	100	12.08	4.28							
Total	300	15.40	9.01	TOTAL	24256.00	292				

Source: Field survey

Tables 5a & 5b show that there is a significant differences among hearing loss of pupils from low, medium and high population density areas ($F=66.869;df=\{2,297\}$; $p< 0.05$) in their right hearing loss and also in their left hearing loss ($F=14.279;df= \{2,297\}$; $p< 0.05$). In all population density areas, pupils from low-density area have highest level of hearing loss with (29.16 mean on the right ear and 18.60 mean on the left ear).

Both medium and high densities areas have almost the same level of hearing loss. Therefore, H_01 is rejected.

Discussion of Findings

Research question 1 states, “In primary school setting, what is the prevalence of the hearing loss among school age children?”

The study reveals that 39.34% (about 1 out of 3 pupils) and 11% (about 1 out of 10 pupils) have conductive unilateral hearing loss in their right and left ears respectively at not more than moderate hearing loss level. The study shows that 0.33%, (about 3 out of 1000 pupils) have moderate-severe hearing loss at both right and left ears.

Research question 2 states, “What are the common types of hearing loss among the school age children?” It was discovered from the study that the most common type of hearing loss among the school age children is low frequency hearing loss with 55.67% and 13% at both right and left ears followed by conductive mild unilateral hearing loss where 36.67 % and 8.33% of the pupils have it on their right and left ears respectively. This is also followed by high frequency hearing loss of 17.67% and 6% on right and left ears with conductive unilateral moderate hearing loss in which 2.67% of the pupils experienced it on their right and left ears. Also, 0.67% and 0.33% of them have moderate severe hearing loss at their right and left ears respectively. There is no severe or profound hearing loss found among examined pupils.

Research question 3 states “Does socio-economic status of the parents has any significant impact on the affected children?” The result clearly shows that socio-economic status of the parents has no significant impact on the affected children.

The Null Hypothesis

Hypothesis 1 states, “There will be no significant differences among hearing loss of children from low, medium and high densities areas.

The result shows that there are significant differences among hearing loss detected in pupils from low, medium and high population density areas as regards both right and left ears. In all, pupils from low population density area have highest level of low frequency hearing loss while both medium and high population density areas have almost the same level of hearing loss. The highest level of hearing loss observed at the low density area could be as a result of health related factors because illnesses like otitis media, cold, carrthal and mumps that these pupils are exposed to are the major causes of conductive hearing loss. According to Park, Turnbull and Turnbull (2002), children that have received poor pre-natal and post-natal care are more at-risk of higher incidence of illness and or impairment.

CONCLUSION AND RECOMMENDATIONS

Conclusion

This study investigated hearing loss among school age children through audiological assessment in Ibadan, Oyo State. The subjects of the study comprised 300 pupils (168 male and 132 female) with average age of 11.45 years. Three research questions and one hypothesis were generated and tested. Data collected were analysed using various statistical methods, the study reveals the following:

- That there are children with hearing loss and those at-risk of having hearing loss.
- That 39.34% (about 1 out of 3 pupils) and 11% (about 1 out of 10 pupils) have conductive unilateral hearing loss in right and left ears respectively at not more than moderate hearing level.

- That 0.33%, (about 3 out of 1000 pupils) have moderate-severe hearing loss at both right and left ears.
- That conductive mild unilateral hearing loss led with 36.67% and 8.33% of the pupils having it in their right and left ears respectively.
- That 2.67% of the pupils experienced unilateral moderate conductive hearing loss in their right and left ears.
- Moderate-severe hearing loss of 0.67% and 0.33% in the right and left ears.
- That socio-economic status of the parents has no significant impact on the hearing loss of the children.
- That there are significant differences among hearing loss detected in pupils from low, medium and high population density areas on both right and left ears.
- That 55.67% and 13% of the pupils have low frequency hearing loss in their right and left ears with 17.67% and 6% having high frequency hearing loss at their right and left ears respectively.

Based on the data analysis, interpretation of results and the discussion of the findings of this study, the following conclusions are made that there are children with hearing loss and those at-risk of having hearing loss in public primary schools in Ibadan, Oyo State, Nigeria. The prevalence of this hearing loss reveals that about 1 out of 3 and about 1 out 10 pupils have mild to moderate hearing loss at their right and left ears respectively with 3 out of 1000 having moderate-severe hearing loss.

The study shows no significant impact of parents' socio-economic status on the hearing loss, and significant differences are found among hearing loss from the three population density areas in Ibadan.

Recommendations

Based on the result, the following recommendations are made.

1. Government should establish formidable and functional hearing testing centres, at least, in every local governments headquarters so that school age pupils would have access to hearing testing.
2. Beside the establishment of aforementioned hearing screening centres, government should also provide adequate funds to manage and cater for necessary and modern audiological equipment so that established centres would perform well.
3. Further, government should make national laws that would compel parents or guardians to at least have the hearing of their wards tested once in every year. The copy of certified result should be made available to the school for proper record purposes and basic for necessary medical and educational interventions.
4. In addition, there is need for awareness programmes and education of the caregiver, through seminars, workshops, conferences and retraining in order to update their knowledge on the adverse effects of undetected hearing loss, most especially of school age children.
5. Lastly, parents and teachers should be adequately informed of the increase risk rate of hearing impairment in children and their concern about hearing should always prompt diagnostic assessment because delayed in identification and management of hearing impairment may impede the child's ability to adapt to family and school activities and community life.

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